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AUTOMATIC SHAFT DIAMETER CALIBRATOR FOR PRODUCTION SYSTEMS

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Actual problems of modern instrument is creation of automated equipment that provides complete technological cycle circuit manufacturing parts machining precision instruments, and in the preparation of precision instruments can be used.

The parameters that most fully characterize final quality of precision instrumentation products, in particular parts of gyroscopic, optical instruments and measuring instruments, are shaping sizes, such as shaft diameters [1, 2], as well as diameters of inner apertures of precision instrument parts.

Results obtained by some of scientists [1, 3, 4, 5] indicates that the problem of measuring the diameter of the shaft practically did not develop in either theoretical or practical aspects for a long time, despite its great need in industry, although a similar problem arose. Development of methods and means of calibration of the diameter of the precision shaft in the manufacture of precision instruments. This is especially true for the creation of automated tools that confirm status of existing commercially available devices.

Analysis of these scientific researches are proved that the methods of obtaining and calibrating sizes on stationary laboratory-type equipment are mainly analyzed, and not directly in production. Devices that can calibrate shaft diameter directly in automatic production mode are virtually absent. In addition, determination of shaft diameter is focused on a one-sided measurement, which can cause significant errors and negative impact on the accuracy of details of type of rotation bodies, which has the consequences of losing accuracy of system or device in which such a shaft is installed. However, studies reflected in their work prove that it is necessary to develop a two-sided measurement type to obtain complete information about object. However, recent copyright work has proven that this is possible. In addition, this capability has an appropriate physical and mathematical foundation based on TONTOR technology [6].

The analysis of these studies proves that basic scientific opinion in determining shaft's diameter is focused on analysis of this phenomenon, on a one-sided measurement, which can make significant errors and negative impact on detail's accuracy of type of bodies of rotation, and this has consequences of loss of accuracy

of system or device in which such shaft is installed. However, studies reflected in their work prove that it is necessary to develop a two-sided measurement type [5] to obtain complete information about object.

The researches carried out by authors over last years [2, 6 - 8] are proved, that in order to perform full quality control of the shafts, such as details of precision measuring instrument, it is necessary to have reliable control over the sizes (diameters) during technological process of part's manufacturing. This is especially true for shafts of different sizes and internal diameters of parts. Defining errors of current size of shaft diameter leads to the inhibition of technological processes and, as a consequence, defects and defects in of parts manufacture.

The purpose of this work is to create basics of action of shaft measuring device in automatic mode as one of structural components of control and measuring complex.

Theoretical studies were conducted regarding determination of shaft diameter, which formed the previous achievements in direction of determining these parameters at the level of concept development, which should be brought to applied research. The basic idea is to create basics of automatic device's operation for measuring the shaft diameters of a component of overall production process. In addition, a micro-drift of part's surface, which can measure the proposed device, will greatly improve precision of manufacture of shaft in automatic mode. It is necessary to provide measurements of such geometrical parameters of shaft formation, as well as micro-drift of workpiece's surface during machining process. This is ensured by subsequent mathematical processing of measured data, which makes it possible to automate process of quality control of workpiece directly during its manufacture or when assembling an device.

The scientific novelty of the proposed work is that all known works are devoted to the improvement of already existing meters of diameter's size of details of the type of shafts or bodies of rotation. The design of these devices is mainly intended for determination of surface parameters by technical means in laboratory conditions, which is extremely inconvenient.

In addition, all enhancements concern not so much the mechanical part as electronic processing of information. devices cannot operate on machining equipment due to their design characteristics (bulky, masses) and complete lack of automation. This results in a loss of workpiece accuracy and an increased amount of workpiece culling as they control either only final machining result or size finishes can result in loss of the required workpiece's surface coordinates.

Therefore, the proposed automatic shaft diameter calibrator is ahead of current production systems for automated industrial equipment, as it is fully automated, it will have a new mechanical design and electronic hardware that is different from existing devices.

Keywords: TONTOR technology, measurement of shaft diameters, quality control, machining equipment.

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ВИКОРИСТАННЯ КВАДРАТУРНИХ ДЕМОДУЛЯТОРІВ ПРИ РОЗВ'ЯЗАННІ ТЕХНІЧНИХ ЗАДАЧ

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Розвиток ефективних систем радіозв'язку на основі фазової модуляції спонукав до розробки високоточних високочастотних (ВЧ) трансиверах, які суттєво збільшують можливості точного вимірювання фазового зсуву радіосигналів в широкому діапазоні частот. При розв'язання технічних задач в енергетиці, при дослідженнях з визначення складу речовин, в точному приладобудуванні та радіонавігації виникає необхідність створення високоточних вимірювальних систем прецизійного вимірювання фазового зсуву радіосигналів [1]. Існуючі ВЧ-трансивери використовують технологію квадратурної модуляції та демодуляції сигналів, а для оптимізації та налагодження характеристик в системах такого типу застосовуються різноманітні математичні моделі та симулятори в різних програмних засобах.

На основі аналізу існучих систем та приладів можна зробити висновок, що для впровадження таких технологій необхідно збільшити точність вимірювання фазового зсуву радіосигналів, частоти яких лежать у ВЧ та НВЧ (надвисокочастотних) діапазонах. Так, за допомогою зондування сигналом (1-6 ГГц) речовини можна провести точний кількісний вимір об'ємної частки